

CLAIMS

What is claimed is:

1. An induction heating system, comprising:

5 a power source operable to produce an alternating current to inductively heat a
workpiece;

a controller operable to control operation of the power source, wherein the controller
is operable to receive programming instructions to change workpiece temperature at a
desired rate of change and automatically control operation of the power source to provide
10 inductive heat to the workpiece to change the workpiece temperature at the desired rate of
change; and

a temperature feedback device operable to provide the controller with an electrical
signal representative of the workpiece temperature.

15 2. The system as recited in claim 1, comprising a data recorder operable to
record workpiece temperature data.

3. The system as recited in claim 1, wherein the power source is operable to
provide sufficient power to enable the system to perform stress relief of a workpiece.

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4. The system as recited in claim 3, wherein the controller is programmable to direct the system to inductively heat a workpiece to perform the stress relief of the workpiece automatically.

5 5. The system as recited in claim 1, wherein the controller is operable to control operation of the power source to lower the workpiece temperature at a desired rate of temperature decrease automatically.

10 6. The system as recited in claim 1, wherein the controller enables a user to establish the desired rate of temperature change by providing a specific desired rate of temperature change.

15 7. The system as recited in claim 1, wherein the controller enables a user to establish the desired rate of temperature change by providing a desired time period for the workpiece temperature to change and a specific temperature change.

8. The system as recited in claim 1, wherein the controller is operable to control the power source to maintain workpiece temperature at a desired temperature for a desired period of time.

20 9. The system as recited in claim 8, wherein the controller is operable to change workpiece temperature to a desired workpiece temperature.

10. The system as recited in claim 1, wherein the controller utilizes Proportional-Integral-Derivative (PID) control.

11. An induction heating system, comprising:

an induction heating power source;

a temperature feedback device operable to provide the system with workpiece temperature data;

a controller operable to control operation of the power source automatically in response to programming instructions and the workpiece temperature data; and

a data recorder operable to receive and record the workpiece temperature data.

12. The system as recited in claim 11, wherein the data recorder records the workpiece temperature data digitally.

13. The system as recited in claim 11, comprising a plurality of temperature feedback devices, wherein the data recorder is operable to record workpiece temperature data from each of the plurality of temperature feedback devices.

14. The system as recited in claim 13, wherein the plurality of temperature feedback devices are thermocouples.

15. The system as recited in claim 11, comprising a disc drive, wherein the data recorder is operable to transfer data to the disc drive for storage on a digital recording media.

16. A system controller for an induction heating system, comprising:

5 a control unit operable to control operation of an inductive heating power source in response to programming instructions;

a user interface to enable a user to provide programming instructions to the control unit; and

a data recorder operable to record workpiece temperature data.

10 17. The system controller as recited in claim 16, comprising a disc drive operable to copy workpiece temperature data from the recorder to a tangible medium.

15 18. The system controller as recited in claim 16, comprising a visual display operable to display a graph of workpiece temperature data over time.

19. The system controller as recited in claim 16, wherein the data recorder is operable to print workpiece temperature data stored in the data recorder.

20 20. The system as recited in claim 16, wherein the system controller is portable.

21. A system controller for an induction heating system, comprising:
a control unit operable to control operation of an inductive heating power source
automatically in response to programming instructions; and
a user interface to enable a user to provide the programming instructions to the
5 control unit, wherein the user interface enables a user to establish a sequence of inductive
heating operations to be performed automatically by the induction heating system from a
selection of inductive heating operations.

22. The system controller as recited in claim 21, wherein one of the inductive
10 heating operations in the selection of inductive heating operations directs the system to
change workpiece temperature at a desired rate of temperature change.

23. The system controller as recited in claim 21, wherein the desired rate of
temperature change is a decrease in workpiece temperature.

24. The system controller as recited in claim 21, wherein one of the inductive
heating operations in the selection of inductive heating operations directs the system to
change workpiece temperature by a desired amount over a desired period of time.

25. The system controller as recited in claim 21, wherein one of the inductive
20 heating operations in the selection of inductive heating operations directs the system to
maintain workpiece temperature at a desired temperature for a desired period of time.

26. The system controller as recited in claim 21, wherein one of the inductive heating operations in the selection of inductive heating operations directs the system to change workpiece temperature from a current workpiece temperature to a new workpiece temperature.

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27. The system controller as recited in claim 21, wherein the system controller is operable to store the sequence of inductive heating operations to be performed automatically by the induction heating system for use in a subsequent inductive heating operation.

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28. A method of operating an induction heating system to heat a workpiece, comprising:

providing the induction heating system with a controller having a user interface to display a plurality of inductive heating operations; and

enabling the user to program the controller to produce a desired temperature versus time profile in the workpiece by enabling the user to establish specific inductive heating operations to be performed and their sequence of performance.

29. The method as recited in claim 28, wherein providing comprises displaying a first inductive heating operation to change workpiece temperature at a desired rate of temperature change.

30. The method as recited in claim 29, wherein providing comprises displaying a second inductive heating operation to maintain workpiece temperature constant for a desired period of time.

5 31. The method as recited in claim 29, wherein enabling comprises enabling the user to input a desired rate of temperature change.

32. The method as recited in claim 28, comprising transporting the induction heating system to the workpiece.

10 33. A method of analyzing heating of a workpiece by an induction heating system, comprising:

adapting the induction heating system with a data recorder operable to record workpiece temperature data digitally;

15 providing the induction heating system with an interface to enable the workpiece temperature data to be transferred from the data recorder to an external computer system; and

programming the computer system with a computer program that is operable to receive the workpiece temperature data and display the workpiece data.

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34. The method as recited in claim 33, wherein programming comprises programming the computer system with a computer program operable to display the workpiece data graphically.

5 35. The method as recited in claim 33, wherein providing comprises providing the induction heating system with a disc drive to store workpiece temperature data transferred from the data recorder.

10 36. The method as recited in claim 33, comprising transporting the data recorder to a worksite and transferring the data to a removable storage media for transport to the computer system.

15 37. A system for heating a workpiece, comprising:
a power source electrically coupleable to an induction heating device; and
a system controller, comprising:
a control unit operable to control operation of an inductive heating power source automatically in response to programming instructions; and
a user interface to enable a user to provide the programming instructions to the control unit, wherein the user interface enables a user to establish a sequence of
20 inductive heating operations from a selection of inductive heating operations that may be performed automatically by the induction heating system.

38. The system as recited in claim 36, wherein the power source and system controller are portable.

39. A system for heating a workpiece, comprising:
5 a heating device;
a power source operable to transmit power to the heating device;
a controller operable to control operation of the power source automatically; and
a portable data recorder operable to record workpiece temperature data from a
10 temperature feedback device.

40. The system as recited in claim 38, wherein the controller and data recorder are housed in a common enclosure.

41. A system controller for a workpiece heating system, comprising:
15 a portable control unit operable to control operation of the workpiece heating system automatically in response to programming instructions, the portable control unit comprising a user interface operable to enable a user to provide programming instructions to the control unit, wherein the user interface enables a user to establish a sequence of heating operations to be performed automatically by the induction heating system by selecting specific heating
20 operations from a plurality of heating operations.

42. The system controller as recited in claim 40, comprising a data recorder operable to record workpiece temperature data received from at least one temperature feedback device.

5 43. The system as recited in claim 1, wherein the controller utilizes Proportional-Integral (PI) control.

44. The system as recited in claim 11, comprising a PCMIA module operable to transfer data from the recorder.

10 45. The system as recited in claim 11, comprising a networking module operable to couple the recorder to a network.